This is an official

DHEC Health Advisory

Distributed via The South Carolina Health Alert Network

June 08, 2006, 5:00pm EDT

Medical Management for Hydrogen Chloride Exposure

Background
At 07:27 on June 7, 2006 Chester County, South Carolina EMA reported a fire at an abandoned textile plant in Great Falls, South Carolina. Through a series of follow-up calls, EPA determined that the closed and abandoned facility was used to store a large quantity of PVC pipe and unknown materials. Approximately 1000 people had been evacuated from the town of Great Falls, and local firefighters were still on scene trying to contain the blaze. State responders were on scene and requested EPA air monitoring support. Upon analysis of air samples, EPA has determined that in the center of the smoke plume hydrogen chloride vapor is in excess of 10 ppm. At this point in time, it does not appear that the exposure exceeded NIOSH IDLH (immediately dangerous to life or health) level of 50 ppm and DHEC surveillance of local hospitals and healthcare providers have not identified patients who have reported with symptoms of hydrogen chloride exposure.

The following medical management information is to provide clinicians information to use when treating patients exposed to hydrogen chloride vapor.

Routes of Exposure
Inhalation is an important route of exposure to hydrogen chloride vapor. Its odor and highly irritating properties generally provide adequate warning for acute, high-level exposures. However, only 50% of exposed persons can perceive hydrogen chloride's odor at the OSHA permissible exposure limit (5 ppm), and odor may not provide adequate warning in the workplace. Hydrogen chloride vapor is heavier than air and may cause asphyxiation in enclosed, poorly ventilated, or low-lying areas.

Children exposed to the same levels of hydrogen chloride as adults may receive larger doses because they have greater lung surface area/body weight ratios and increased minute volumes/ body weight ratios. In addition, they may be exposed to higher levels than adults in the same location because of their short stature and the higher levels of hydrogen chloride found nearer to the ground.

General Health Effects

- Concentrated hydrogen chloride can be corrosive to the skin, eyes, nose, mucous membranes, and respiratory and gastrointestinal tracts.
- Inhalation of hydrogen chloride can lead to pulmonary edema. Ingestion can cause severe injury to the mouth, throat, esophagus, and stomach.
- Other effects of exposure include shock, circulatory collapse metabolic acidosis, and respiratory depression.

Acute Exposure

- Hydrogen chloride is a strong mineral acid; its corrosive and irritant properties are the primary concern in both acute and chronic exposures.

- Children do not always respond to chemicals in the same way that adults do. Different protocols for managing their care may be needed.

Respiratory effects
Hydrogen chloride vapor is intensely irritating to the mucous membranes of the nose, throat, and respiratory tract. Brief exposure to 35 ppm causes throat irritation, and levels of 50 to 100 ppm are barely tolerable for 1 hour. The greatest impact is on the upper respiratory tract; exposure to high concentrations can rapidly lead to swelling and spasm of the throat and suffocation.
Most seriously exposed persons have immediate onset of rapid breathing, blue coloring of the skin, and narrowing of the bronchioles. Patients who have massive exposures may develop an accumulation of fluid in the lungs.

Exposure to hydrogen chloride can lead to Reactive Airway Dysfunction Syndrome (RADS), a chemically- or irritant-induced type of asthma.

Children may be more vulnerable to corrosive agents than adults because of the relatively smaller diameter of their airways. Children may also be more vulnerable to gas exposure because of increased minute ventilation per kg and failure to evacuate an area promptly when exposed.

Information regarding the health effects to other functions (metabolic, dermal, ocular, gastrointestinal, cardiovascular) are available at the Agency for Toxic Substances and Disease Registry (ATSDR) website at: http://www.atsdr.cdc.gov/MHMI/mmg173.html#bookmark01

Potential Respiratory Sequelae
Although complete recovery is the normal course, symptoms and prolonged pulmonary deficits can persist. Patients may develop Reactive Airways Dysfunction Syndrome (RADS).

Emergency Department Management for Respiratory exposure to Hydrogen Chloride

- Administer supplemental oxygen by mask to patients who have respiratory symptoms. Treat patients who have bronchospasm with aerosolized bronchodilators. The use of bronchial sensitizing agents in situations of multiple chemical exposures may pose additional risks. Consider the health of the myocardium before choosing which type of bronchodilator should be administered. Cardiac sensitizing agents may be appropriate; however, the use of cardiac sensitizing agents after exposure to certain chemicals may pose enhanced risk of cardiac arrhythmias (especially in the elderly). Sympathomimetic bronchodilators generally will reverse bronchospasm in patients exposed to hydrogen chloride.

- Consider racemic epinephrine aerosol for children who develop stridor. Dose 0.25-0.75 mL of 2.25% racemic epinephrine solution in 2.5 cc water, repeat every 20 minutes as needed, cautioning for myocardial variability.

- Observe patients for at least 24 hours, repeating appropriate tests and chest examinations as needed. Follow-up as clinically indicated.

- Some authorities recommend treatment with high doses of corticosteroids for patients who have high-dose exposures, but the value of this treatment is questionable and unsupported by clinical studies.

Information regarding emergency department management for eye, skin and ingestion exposure are available at the Agency for Toxic Substances and Disease Registry (ATSDR) website at: http://www.atsdr.cdc.gov/MHMI/mmg173html#bookmark01

Disposition and Follow-up
Patients who develop serious signs or symptoms of hydrogen chloride exposure should be hospitalized and observed closely for 4 to 6 hours or until asymptomatic.

Delayed Effects
Delayed effects are unlikely in patients who have minor symptoms that resolve quickly. However, symptoms can be delayed for 1 to 2 days.

Patient Release
Patients who have had minor exposure and who are asymptomatic 4 to 6 hours after exposure may be discharged and advised to seek medical care promptly if symptoms develop (see the *Hydrogen Chloride-Patient Information Sheet* available at:
http://www.atsdr.cdc.gov/MHMI/mmg173-handout.pdf#page=1

Follow-up

- Obtain the name of the patient's primary care physician so that the hospital can send a copy of the ED visit to the patient's doctor.
- Patients who have inhaled significant amounts of hydrogen chloride should be monitored with pulmonary function tests. Patients should also be monitored for the development of Reactive Airway Dysfunction Syndrome (RADS), a chemically- or irritant-induced type of asthma. About 2 to 4 weeks after an ingestion, consider follow-up esophagoscopy and an upper gastrointestinal tract series to evaluate secondary scarring or stricture formation.
- Patients who have skin or corneal injury should be re-examined within 24 hours.

Additional Sources for Information

- General Information about Hydrogen Chloride:
  www.atsdr.cdc.gov/MHMI/mmg173.html#bookmark01

- Hydrogen Chloride Patient Information Sheet:
  www.atsdr.cdc.gov/MHMI/mmg173-handout.pdf#page=1

- Pre-Hospital Decontamination Information:
  www.atsdr.cdc.gov/MHMI/mmg173.html#bookmark03

DHEC Contact Information for Reportable Diseases/Conditions and Reporting Requirements

Reporting of cases or possible cases of persons with suspected exposure to hydrogen chloride is consistent with South Carolina Law requiring the reporting of diseases and conditions to your state or local public health department. (State Law # 44-29-10 and Regulation # 61-20) as per the DHEC 2004 List of Reportable Conditions available at:
http://www.scdhec.gov/health/disease/docs/reportable_conditions.pdf

Federal HIPAA legislation allows disclosure of protected health information, without consent of the individual, to public health authorities to collect and receive such information for the purpose of preventing or controlling disease. (HIPAA 45 CFR §164.512).

Regional Public Health Offices

Mail or call reports to the Epidemiology Office in each Public Health Region.

Region 1
(Anderson, Oconee)
220 McGee Road
Anderson, SC 29625
Phone: (864) 231-1966
Fax: (864) 260-5623
Nights / Weekends: 1-866-298-4442

(Abbeville, Edgefield, Greenwood, Laurens, McCormick, Saluda)
1736 S. Main Street
Greenwood, SC 29646
Phone: 1-888-218-5475
Fax: (864) 942-3690
Nights / Weekends: 1-800-420-1915

Region 2
(Greenville, Pickens)
PO Box 2507
200 University Ridge
Greenville, SC 29602-2507
Phone: (864) 282-4139
Fax: (864) 282-4373
Nights / Weekends: (864) 460-5355 or 1-800-993-1186

(Cherokee, Spartanburg, Union)
PO Box 4217
151 E. Wood Street
Spartanburg, SC 29305-4217
Phone: (864) 596-2227 ext. 210
Fax: (864) 596-3443
Nights / Weekends: (864) 809-3825

Region 3
(Chester, Lancaster, York)
PO Box 817
1833 Pageland Highway
Lancaster, SC 29721
Phone: (803) 286-9948
Fax: (803) 286-5418
Nights / Weekends: 1-866-867-3886 or 1-888-739-0748

(Fairfield, Lexington, Newberry, Richland)
2000 Hampton Street
Columbia, SC 29204
Phone: (803) 576-2749
Fax: (803) 576-2993
Nights / Weekends: (803) 304-4252

Region 4
(Clarendon, Kershaw, Lee, Sumter)
PO Box 1628
105 North Magnolia Street
Sumter, SC 29150
Phone: (803) 773-5511
Fax: (803) 773-6366
Nights/Weekends: 1-877-831-4647

(Chesterfield, Darlington, Dillon, Florence, Marlboro, Marion)
145 E. Cheves Street
Florence, SC 29506
Phone: (843) 661-4830
Fax: (843) 661-4859
Nights / Weekends: (843) 660-8145

Region 5
(Bamberg, Calhoun, Orangeburg)
PO Box 1126
1550 Carolina Avenue
Orangeburg, SC 29116
Phone: (803) 533-7199
Fax: (803) 536-9118
Nights / Weekends: (803) 954-8513

Region 5 (cont)
(Aiken, Allendale, Barnwell)
1680 Richland Avenue, W. Suite 40
Aiken, SC 29801
Phone: (803) 642-1618
Fax: (803) 643-8386
Nights / Weekends: (803) 827-8668 or 1-800-614-1519

Region 6
(Georgetown, Horry, Williamsburg)
2830 Oak Street
Conway, SC 29526-4560
Phone: (843) 365-3126
Fax: (843) 365-3153
Nights / Weekends: (843) 381-6710

Region 7
Berkeley, Charleston, Dorchester)
4050 Bridge View Drive, Suite 600
N. Charleston, SC 29405
Phone: (843) 746-3806
Fax: (843) 746-3851
Nights / Weekends: (843) 219-8470

Region 8
(Beaufort, Colleton, Hampton, Jasper)
219 S. Lemacks Street
Walterboro, SC 29488
Phone: (843) 525-7603
Fax: (843) 549-6845
Nights / Weekends: 1-800-614-4698

Bureau of Disease Control
Acute Disease Epidemiology Division
1751 Calhoun Street
Box 101106
Columbia, SC
Phone: (803) 898-0861
Fax: (803) 898-0897
Nights / Weekends: 1-888-847-0902

Categories of Health Alert messages:
Health Alert: conveys the highest level of importance; warrants immediate action or attention.
Health Advisory: provides important information for a specific incident or situation; may not require immediate action.
Health Update: provides updated information regarding an incident or situation; unlikely to require immediate action.